Physicochemical and Pharmacognostical studies of Cyathea gigantea Medicinal Plant

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Abstract

Traditional systems of medicine, especially Ayurveda contains number of preparations for treating liver & GIT disorders. In the present study deals with physicochemical and Pharmacognostical analysis study *of Cyathea gigantea* plant. The physicochemical analysis of leaves powder was carried out. In this study ash values (total ash, acid insoluble ash and water soluble ash) were determined. Results of phytochemical investigation revealed the presence of various phytoconstituents like glycosides, carbohydrates, proteins, amino acids, sterols, triterpenes, total phenolic compound, flavonoids and saponin.

Our study also proved that this drug possess considerable amount of flavonoid and phenolic compounds.

Keyword - *Cyathea gigantean,* GIT disorders, Phytochemical, Phytoconstituents ect.

Introduction

Modern herbal therapy has only recently developed and commercialized old techniques. Many patients went to herbal medicine because they were unsatisfied with conventional treatment options like surgery or drugs. Due in large part to the perception that they are safe since they are natural, herbal medicines are still widely used today.[1-3]

Cyathea gigantea (*C. gigantea*) (Wall. ex. Hook.) (Cyatheaceae) is a tree fern found extensively in moist open areas of Northeastern to Southern India, Thailand, Srilanka, Nepal and Western Java. The Cyatheaceae is the scaly tree fern family and includes the world's tallest tree ferns, which reach heights up to 20 m. Traditionally the fresh rhizome of *C. gigantea* mixed with black pepper seeds powdered and taken orally with milk twice a day for one week in stomach against white discharges.

C. gigantea have several active constituents like triterpenes, sterols, saponins, flavonoids, hentriacontane, β-sitostenone, β-sitostanone, diploterol, sitosterol, hopan-29-ol and whole plant contains oleanolic acid. The first investigation on flavonoids constituents in the genus *Cyathea* was carried out by Harada *et al*. Oleanolic acid is a triterpenoid having antitumor, hepatoprotective and antiviral activity. Oleanolic acid is found to exhibit strong anti-HIV activity. Dietary phytosterols like β-sitosterol is having anticancer activity.

Herbal drugs play a major role in the treatment of hepatic disorders. In the absence of reliable liver protective drugs in modern medicine, in India, a number of medicinal plants and their formulations are used to cure hepatic disorders

in traditional systems of medicine. Several studies were conducted in the field of drug discovery and development but due to the side effects of modern medicine, natural remedies are considered to be effective and safe alternate treatments for hepatotoxicity.

The *Cyathea gigantea* as a Source of Natural Antioxidant The antioxidant activity of hexane, chloroform, hydro-alcoholic and aqueous extract of whole plant of *Cyathea gigantea* (family *Malvaceae*) was evaluated using in-vitro models, DPPH free radical scavenging,scavenging of hydrogen peroxide and reducing power method .[4-5]

2. MATERIAL & METHODS

Collection of plant material and Preparation of plant powder

The leaves of Cyathea gigantea plant were collected from natural habitat in pachmarhi, madhya pradesh . The plant leaves was used for the preparation of the extract. The plants leaves was collected and dried under shade and then coarsely powdered with the help of mechanical grinder. After passing through filter No. 40, the powder was placed in an airtight container for later use.

Physicochemical and Pharmacognostical studies of aerial parts of selected plants [6-9]

Physico-Chemical Analysis

For the purpose of determining various physicochemical properties, conventional process was used to the powdered plant material.

Determination of ash values

Ash values are calculated in order to find low-quality goods, used-up medications, and sand or other earthy materials. Using water-soluble ash and acid insoluble ash, it may also be used as a method of identifying the chemical components.

Total ash value

A tared silica crucible was filled with precisely 3 gms of air dried powder, which was then burned until free of carbon at a temperature no higher than 4500C. Calculations were made to determine the amount of total ash in relation to the air-dried medication.

Acid insoluble ash

The ash produced using the aforementioned process was heated in 25ml of diluted HCl for 5 minutes. The residue was gathered on filter paper without ash, rinsed in hot water, burned,

Water soluble ash

It was found by using this procedure “whole ash collected was heated in 25 cc of water for 5 minutes. The insoluble material was collected using the ash-free filter paper, which was then washed with hot water and burnt at a low temperature to a constant weight. The weight of the insoluble substance was divided by the weight of the ash. The weight disparity represents the water-soluble ash. The ratio of the amount of water-soluble ash to the air- dried medicine was calculated”.

Determination of moisture content (Loss on drying)

After precisely weighing"10 g of the medication (without any prior drying) was added to a tarte evaporating plate and stored in an oven at 1050 C for 5 hours before being weighed. Calculations were made for the air dried medication to determine the percentage loss on drying".

Determination of foreign organic matter

A thin coating of the drug sample, which was precisely weighed at 100 g, was applied. By using a lens and conducting an unaided eye check, the foreign object was discovered (6X). The foreign stuff was divided, weighed, and the proportion of the total weight determined.

Determination of swelling index

When mucilage is present, swelling index is calculated. One gramme of the powdered plant material, precisely weighed, was added to a 150 ml measuring cylinder. 50 ml of distilled water was added to this, and it was set away for 24 hours while being occasionally shaken. After 24 hours of soaking, the seeds' volume was measured**.**

Preparation of extracts:

The collected, cleaned and powdered leaves of *A. cordifolia*, were used for the extraction purpose. 500 gm of powdered material was evenly packed in the soxhlet apparatus. It was then extracted with various solvents from non-polar to polar such as petroleum ether, chloroform, acetone and ethanol. The solvents used were purified before use. The extraction method used was continuous hot percolation and carried out with various solvents, for 72 hrs. The aqueous extraction was carried out by cold-maceration process. The extracts were concentrated by vacuum distillation to reduce the volume to 1/10; the concentrated extracts were transferred to 100ml beaker and the remaining solvent was evaporated on a water bath. Then they were cooled and placed in a dessicator to remove the excessive moisture. The dried extracts were packed in airtight containers and used for further studies. [10--14]

Phytochemical Screening. [10-14]**:**

The various extract obtained after extraction were subjected for phytochemical screening to determine the presence of following various phytochemical present in the extracts.

Tests for carbohydrates and glycosides:

Molisch's test:

Sample was treated with 2-3 drops of 1% alcoholic - napthol solution and 2 ml of conc. sulphuric acidwas added along the sides of the test tube. Appearance of brown ring at the junction of two liquids shows the presence of carbohydrates.

Legal's test:

To the sample 1 ml of pyridine and few drops of sodium nitroprusside solutions were added and then it was made alkaline with sodium hydroxide solution. Appearance of pink to red colour shows the presence of glycosides.

Borntrager's test:

Sample was treated with chloroform and then the chloroform layer was separated. To this equal quantity of dilute ammonia solution was added. Ammonia layer acquires pink color, showing the presence of glycosides.

Test for alkaloids:

A small portion of the sample was stirred separately with few drops of dilute hydrochloric acid and was tested with various reagents for the presence of alkaloids. The reagents are

Dragendroff's reagent - Reddish brown ppt

Wagner;s reagent - Reddish brown ppt

Mayer's reagent - Cream color ppt

Hager's reagent - yellow color ppt

Test for proteins and free amino acids:

Small quantities of the sample were dissolved in few ml of water and treated with following reagents.

- Million's reagent: Appearance of red color shows the presence of protein and free amino acid.
- Ninhydrin reagent: Appearance of purple color shows the presence of Proteins and free amino acids
- Biuret's test: Equal volumes of 5% sodium hydroxide solution & 1% copper sulphate solution was added.Appearance of pink or purple color shows the presence of proteins and amino acids.

Test for tannins:

A small quantity of the sample was taken separately in water and test for the presence of phenol compounds and tannins was carried out with the following reagents.

Dilute Ferric chloride solution (5%) - Violet color.

10% lead acetate solution - White precipitate

Test for flavonoids

Alkaline reagent test:

To the test solution add few drops of magnesium hydroxide solution, intense yellow colour is formed which turns to colourless on addition of few drops of dilute acid indicates presence of flavonoids.

Shinoda's test:

Small quantities of the sample were dissolved in alcohol, to this piece of magnesium followed by concentrated hydrochloric acid drop wise added and heated. Appearance of magneta color shows the presence of flavonoids**.**

Tests for fixed oils and fats Spot test:

- A small quantity of sample was separately pressed between two filter papers. Appearance of oil stain on the paper indicates the presence of fixed oil.
- Few drops of 0.5Nalcoholic potassium hydroxide were added to a small quantity of sample along with a drop of phenolpthlein, the mixture was heated on a water bath for 1-2 hours, formation of soap or partial neutralization of alkali indicates the presence of fixed oils and fats.

Tests for steroids and triterpenoids:

Libermann-burchard test:

Sample was treated with few drops of acetic anhydride, boils and cooled. Then concentrated sulphuric acid was added from the side of test tube, brown ring was formed at the junction two layers and upper layer turns green which shows presence of steroids and formation of deep red colour indicates presence of triterpenoid.

Salkowski test:

Sample was treatedwith few drop of concentrated sulphuric acid, red colour at lower layer indicates presence of steroids and formation of yellow coloured lower layer indicates presence of triterpenoids.

Test for mucilages and gums:

Small quantities of sample was added separately to 25 ml. of absolute alcohol with constant stirring and filtered. The precipitates was dried in oil and examined for its swelling property for the presence of gum and mucilage.

Test for waxes:

To the test solution alcoholic alkali solution was added, the waxes get saponified.

RESULTS AND DISCUSSION

Physicochemical analysis of crude drug

The physicochemical analysis of leaves powder was carried out. In this study ash values via total ash, acid insoluble ash and water soluble ash were determined. The total ash values was found that 11.34% w/w and acid insoluble ash values was found that 0.85% and water soluble ash values was found 4.12% for leaves of *Cyathea gigantean* .The results are shown in Table 1.

Table 1: Ash Values

Plant Name	**Part Used**	**Types of Ash**	**Percentage of Ash(w/w)**
Cyathea gigantea	Leaves	Total ash	11.34
		Acid Insoluble	0.85
		Water soluble	4.12

Determination of extractive value

Extractive values determined were showed in table 2 The extractive values indicate the presence of considerable amount of constituents in solvents.

Table 2: Extractive Values of *Cyathea gigantea*

Solvent	% Yield of Extract
Pet. Ether	2.13
Chloroform	3.86
Acetone	9.6
Ethanol	14.2
Aqueous	27.7

Preliminary Phytochemical Analysis

The phytoconstituents were identified by chemical tests, which showed the presence of various constituents in the different extracts. The results shown that the acetone, ethanol and aqueous extracts of leaves of *Cyathea gigantea* contains maximum number of pharmacologically active constituents. The results are shown in Table 3

Table No.3: Preliminary phytochemical studies of dried leaves of *Cyathea gigantea*

Sl. No.	Constituents	Tests	Pet.ether extract	CHCl3 extract	Acetone extract	Ethanolic extract	Aqueous extract
1.	CARBOHYDRATES	Molisch's test	-	-	-	+	+
		Fehling's test	-	-	-	+	+
2.	GLYCOSIDES	Legal's test	-	-	-	-	-
		Borntrager's test	-	-	-	-	-
		Baljet test	-	-	-	-	-
3.	FIXED OIL ANDFATS	Spot test	+	+	-	+	-
		Saponification test	+	-	-	+	-

4.	PROTEINS& AMINO ACIDS	Millon's test	-	-	-	+	+
		Ninhydrin test	-	-	-	+	+
		Biuret test	-	-	-	+	+
5.	SAPONINS	Foam test	-	-	-	-	-
6.	PHENOLIC COMP.	$FeCl_3$ test	-	-	+	+	+
		Lead acetate test	-	-	+	+	+
7.	PHYTOSTEROLS	Salkowski test	+	-	+	+	+
		Libermann-bucchard test	+	-	+	+	+
8.	ALKALOIDS	Dragendorff's test	-	-	-	-	-
		Mayer's test	-	-	-	-	-
		Wagner's test	-	-	-	-	-
		Hager's test	-	-	-	-	-
9.	GUMS&MUCILAGE	Froth test	+	-	-	+	+
		Alcoholic test	+	-	-	+	+
10.	FLAVONOIDS	Lead acetate test	-	-	+	+	+
		Con. H_2SO_4 test	-	-	+	+	+
		FeCl3 test	-	-	+	+	+

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